A conspectus of high-country *Craspedia* (Asteraceae: Gnaphalieae) of mainland south-eastern Australia

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Introduction

The genus *Craspedia* G.Forst. comprises at least 45 species and is found throughout much of Australia and New Zealand. There is a concentration of species in the high mountain areas of south-eastern Australia and these are a major component of the annual summer floral display there. Species of *Craspedia* have been noted for the plasticity of many of their vegetative and floral characters and their propensity to hybridise (Costin *et al.* 1979, 2000; Everett & Thompson 1992). It is undoubtedly for this reason that most taxa in Australia were known as species aggregates until recently (Everett & Thompson 1992; Everett & Doust 1992).

In previous descriptions of high-country *Craspedia*, key diagnostic characters were leaf colour and shape, and flower colour (Everett 1999; Everett & Doust 1992). During recent field work for the revision of the *Kosciuszko Alpine Flora* (Costin *et al.* 2000) and the longer-term task of establishing a classification of treeless plant communities (McDougall & Walsh 2007), it became obvious that with the exception of white- to cream-flowered species, flower colour was a poor primary character for distinguishing species in high-country vegetation. We have attempted to employ the keys available since the description of several new alpine *Craspedia* by Everett and Thompson (1992), but have encountered difficulties due in part to variability in flower colour and interpretation of old or incomplete herbarium specimens. Further, there is no comprehensive account of the group, with previous works dealing with only part of the geographic range (e.g. New South Wales – Everett & Doust 1992; Kosciuszko National Park – Costin *et al.* 2000; Victoria – Everett 1999). Since 1992 we have attempted to equate our field observations with herbarium material and published species circumscriptions. This has led us to re-evaluate the various treatments of the high country species of *Craspedia* and to construct a key that we believe provides a more satisfactory means for identification across the range of the species. This key is offered here. It includes a species previously outlined as *Craspedia* sp. B (*sensu* Costin *et al.* 2000), formalised here as *Craspedia adenophora*.

Abstract

A reassessment is presented of previous treatments of the 11 species of *Craspedia* G. Forst. recorded from high-montane to alpine areas of south-eastern mainland Australia, with brief notes on the distribution and habitats of each species. A revised key to the species of this area is provided. A new species, *Craspedia adenophora* K.L. McDougall & N.G. Walsh, is described.

Muelleria 26(2): 3-10 (2008)

Royal Botanic Gardens Melbourne

Revised key to high country *Craspedia* of the south-eastern Australian mainland

1 Florets white or pale cream 2

1: Florets yellow or orange 3

2 Leaves broad, more than 5 mm wide, green and glabrous except for occasional hairs on margins; Kosciuszko National Park endemic ..... ***C. leucantha***

2: Leaves narrow, less than 5 mm wide, covered with long fine hairs ..... ***C. alba***

3 Leaves discolorous, very sticky to the touch (and often smelling of mouldy orange), the upper surface dark green with dense microscopic subsessile or stalked glandular hairs, the lower surface silvery-grey with dense, long, loosely-appressed woolly hairs and glandular hairs; florets generally yellow (rarely orange) ..... ***C. adenophora***

3: Leaves not discolorous, or if slightly so, then without dense glandular hairs; flowers yellow or orange 4

4 Leaves wholly or partly grey- or white-woolly on the lamina (scape leaves sometimes glabrescent) 5

4: Leaves green, pubescent (with long multi-septate hairs), scabrous or ±glabrous (sometimes conspicuously woolly on the margins) 7

5 Leaves with variably woolly indumentum which often appears as though the woolly hairs have been shed and persist only in tufts or patches, or the indumentum sometimes confined to the marginal area and/or the midrib on the abaxial surface ..... ***C. hybrid*** (see notes re *C. maxgrayi* below)

5: Rosette leaves woolly on both surfaces with the indumentum ±entirely covering the lamina (cauline leaves sometimes glabrescent or glabrous except on margins) 6

6 Secondary, longitudinal veins conspicuous (leaves usually appearing 3–5-nerved); fibrous leaf bases strongly persistent and numerous on older plants; flowers generally yellow in New South Wales populations and orange in Victorian populations; occurs in lower alpine/subalpine communities ..... ***C. coolaminica***

6: Secondary veins inconspicuous; leaf bases not strongly persistent; flowers generally yellow; confined to high alpine communities in Kosciuszko National Park ..... ***C. maxgrayi***

7 Leaves dark green and ±glabrous (sometimes with sparse hairs), lamina with a conspicuous marginal fringe of white woolly hairs; flowers generally yellow ..... ***C. lamicola***

7: Leaves light green, pubescent, or glabrous, but lamina without a conspicuous marginal fringe of white woolly hairs (margins sometimes slightly woolly in *C. aurantia* but then surfaces scabrous) 8

8 Leaves conspicuously pubescent with long multi-septate hairs terminating in long fine apices; flowers generally yellow but occasionally pale yellow or orange; Kosciuszko National Park endemic ..... ***C. costiniana***

8: Leaves scabrous or ±glabrous 9

9 Leaves long-attenuate at the base, with the base of the leaves distinctly reddish or purplish 10

9: Leaves not long-attenuate at the base or if so then the base of the leaves white or green, rarely with reddish suffusions 11

10 Basal leaves broadly spathulate, the widest 20–40 mm wide, very long-attenuate at the base; in grassy understorey of montane woodland or forest ..... ***C. sp. 1***

10: Basal leaves linear-spathulate to spathulate, the widest to 12 (rarely to 18) mm wide, mostly long-attenuate at the base; subalpine areas, often in grassy plains or open heathlands ..... ***C. crocata***

11 Stereome of capitulum bract narrowly ovate or narrowly oblong, often slightly constricted above the middle; the membranous margins not obviously extending around herbaceous stereome tip, tip greatly exceeding margins and giving the bract a three-lobed appearance; flowers commonly yellow ..... ***C. jamesii***

11: Stereome of capitulum broadly ovate; the membranous margins often extending around herbaceous stereome tip (but if not then stereome tip not greatly exceeding margins); flowers commonly orange ..... ***C. aurantia***

Notes relating to key: Users should note that hybridisation between taxa is common and some specimens with intermediate characters may be difficult to assign. Hybrids are generally commonest in ecotonal sites and/or in areas where the putative parent species occur in close proximity in the same habitat.

Where some indication of habitat is provided, 'alpine' refers to those areas above the treeline, 'subalpine' refers to areas that are below the altitudinal treeline, but treeless (typically in cold air drainage hollows) or lightly wooded usually with Snow-gum (*Eucalyptus pauciflora* Sieber ex Spreng. *sens. lat.*), and 'montane' refers to the zone supporting taller woodland or forest usually dominated by or including tree species other than Snow-gum (e.g. *Eucalyptus dalrympleana* Maiden, *E. delegatensis* R.T. Baker, *E. perriniana* F. Muell. ex Rodway).

Notes on mountain taxa

Craspedia adenophora K.L. McDougall & N.G. Walsh *sp. nov.*

Craspedia sp. B. *sensu* Costin *et al.*, *Kosciuszko Alpine Flora* p. 349 (2000).

Illustration: Costin *et al.* (2000), p. 192.

A Craspedia *speciebus alpinis et subalpinis foliis basalis et bracteis infernis discoloribus, supra glanduloso-viscidis, subter appreso-lanuginosis distinguenda.*

***Type*: VICTORIA.** Mt Stirling, c. 50 m S of summit trig, 15.i.2002, *N.G. Walsh 5516* (holotype: MEL; isotype CANB, NSW)

Tufted or loosely tufted *herbs* c. 10–40 cm high, densely glandular with short microscopic glandular-septate hairs and sessile glands, sticky to the touch. *Leaves* arising from a short erect or ascending rootstock; scape densely glandular, sometimes with appressed silky hairs; stem bracts ±undulate, densely glandular, stem-clasping at base; lower bracts ±discolorous, upper bracts sometimes concolorous, glabrescent, but usually retaining cottony hairs on midrib and margins; leaves mostly basal, obovate-spathulate to oblanceolate-spathulate or narrowly so, 6.5–18 cm long, 8–15(–20) mm wide, discolorous, the adaxial surface dark green, densely glandular, sometimes with variable loosely appressed woolly hairs, particularly on the midrib, densely appressed woolly-tomentose abaxially with short glandular hairs intermixed. *Compound heads* hemispherical to globose at maturity, c. 1.5–3.5 cm diameter; partial heads 5–10 flowered; main bract subtending the lower partial heads with narrowly to broadly ovate to ovate (sometimes obscurely 3-lobed), 6–10 mm long, 2–4.5 mm wide, moderately to densely glandular stereome, ±woolly toward the base, the narrow scarious margins glabrous or ±woolly, rarely extending to the apex of the stereome; corolla yellow (or occasionally pale yellow or orange); achenes c. 1.5–2.5 mm long, antrorsely sericeous; pappus bristles plumose, c. 3.5–5 mm long (Fig. 1).

***Representative specimens*: NEW SOUTH WALES.** south spur of Perisher, 18.i.1970, (NSW); near Seamans Hut, Mt Kosciusko, Jan. 1970, *C. Totterdell 41* (CANB); Top of Main Range on saddle NE of Carruthers Peak, 24.i.2000, *K.L. McDougall 753* (MEL). **VICTORIA.** Snowy Range, 8 km N from Mt Arbuckle, 2.i.1981, *N.G. Walsh 2494* (CANB, MEL, NSW); Mt Buffalo NP, junction of main road between Park Office and Tatra Inn, 26.i.1982, *P.S. Short 1370* (MEL, NSW); The Bluff, 26.i.1985, *D.E. Albrecht 1558* (MEL, NSW); Alpine National Park, Wonnangatta Moroka Unit, c. 1 km NNW from Mt Reynard summit, 14.xii.2000, *N.G. Walsh 5263* (MEL); Mt Buller, beside walking track just below summit cairn, 21.i.2001, *N.G. Walsh 5298* (CANB, MEL); Alpine National Park, access track to Snowy Range airstrip, 22.ii.2001, *N.G. Walsh 5312* (CANB, MEL).

***Distribution and habitat*:** In Kosciuszko National Park, *C. adenophora* is common in the vicinity of Blue Lake, between Carruthers Peak, Mt Twynam and Hedley Tarn, and elsewhere on the Main Range (e.g. Northcote Pass and Mt Townsend). It is locally common in the Victorian high country (e.g. The Bluff, Mt Buller, Mt Buffalo, Mt Stirling, Snowy Plain) but appears to be extremely rare on the Bogong High Plains where we have observed it growing in grassland depressions at the head of Cope Creek.

Throughout its range *C. adenophora* favours dry to damp grasslands and open heaths, and is often found in the vicinity of exposed rock. It has been recorded between 1520 and 2060 metres a.s.l.

***Notes*:** *Craspedia* sp. B was regarded by Everett and Doust (1992), as a hybrid of various species. At that time it was known from a small number of plants in a limited portion of the Kosciuszko Main Range, so a hybrid origin was not an unreasonable suggestion. During field work for the *Kosciuszko Alpine Flora* revision, a more extensive search was made to assess the uniformity and abundance of the entity.

Figure 1. Holotype of *Craspedia adenophora* (MEL 2123126).

At times it was found to be the dominant or sole *Craspedia* in the vegetation and, although some presumed hybrids between it and *C. maxgrayii* J. Everett & Joy Thomps. were found (Max Gray, pers. comm.), *C. adenophora* appeared to be a distinctive and readily identifiable species. Its conservation status is assessed as Rare (*sensu* Briggs & Leigh 1996). An IUCN assessment (IUCN 2001) could place it in any of the categories Near Threatened, Vulnerable or Endangered, depending on the model of climate change that is accepted. As it is not the altitudinally highest occurring *Craspedia* it is probably at lower risk than several of the other species such as *C. costiniana* J.Everett & Joy Thomps., *C. leucantha* F. Muell. or *C. maxgrayi*.

Craspedia adenophora is readily distinguished from other *Craspedia* species in the high country by its discolorous and sticky leaves, which tend to have an odour reminiscent of mouldy oranges or citronella. Flower colour is predominantly bright yellow to pale yellow (rarely orange).

Craspedia species with discolorous leaves may occasionally be found in the high country that are not attributable to *C. adenophora*. For instance, we have observed plants of *C. maxgrayi* to shed hairs on parts of the upper leaf surface in autumn, prior to withering before the onset of snow cover in winter. A presumed hybrid of high mountain summits in Victoria (see notes under *C. maxgrayi*) has leaves of variable hairiness, which may sometimes appear discolorous. Some collections from Mt Buffalo in Victoria (e.g. *J. Russell 106*, MEL 1536817; *N.C. Ford 13*, NSW 297661) have discolorous leaves with very long-attenuate bases and prominent veins. The upper leaf surface of these plants is not glandular (or with a few glandular hairs only towards the leaf tip). These plants are possibly hybrids between *C. coolaminica* J. Everett & Joy Thomps. and *C. adenophora*, both of which have been recorded from Mt Buffalo

Etymology: The epithet (Greek. *aden* = gland, *phora* = bearing) means 'gland-bearing' and refers to the viscid indumentum of the vegetative parts.

Craspedia alba J.Everett & Joy Thomps.

Illustration: Everett and Doust (1992), p. 223; Costin *et al.* (2000), p. 192; Everett (1999), p. 761.

Plants of this species are generally much smaller than other high country *Craspedia*. They tend to grow in extensive patches in seasonally inundated pools and gravely pavements of short alpine herbfield (Community 10 of McDougall & Walsh 2007). In Victoria, *C. alba* is only known from the Bogong High Plains, where it is extremely localised in Pretty Valley. Although locally common on the Main Range of Kosciuszko National Park in New South Wales in similar habitat, this species is apparently restricted to the area between the Ramshead Range and Mt Twynam. Nationally, the species might be regarded as vulnerable (*sens.* Briggs & Leigh 1996) because of its highly restricted habitat, most commonly at the base of snow packs of the highest mountains. It may be especially affected by decreases in rainfall and snow cover predicted in models of climate change for the Alps (Hennessy *et al.* 2002). It is appropriately regarded as threatened under the Victorian *Flora and Fauna Guarantee Act 1988* given its small population size and extent on the Bogong High Plains.

Craspedia aurantia J.Everett & Joy Thomps.

Illustration: Everett and Doust (1992), p. 224; Costin *et al.* (2000), p. 192; Everett (1999), p. 761.

New South Wales populations of this species, especially in the alpine zone, may have bright orange or bright yellow flowers. Costin *et al.* (2000) report some overlap of floral characters with *C. jamesii* J. Everett & Joy Thomps. and treat these two species as a complex. We agree that there are difficulties in reliably separating these entities but tentatively retain them here as separate pending a detailed study across the range of the taxa. Victorian populations of *C. aurantia* appear to be much more consistently orange-flowered. The main bract of the involucre may be three-lobed at times but never so pronouncedly as in *C. jamesii*. Everett (1999) indicated that the leaf bases of *C. aurantia* were often conspicuously reddish but these were not observed by us in the field. *Craspedia aurantia* is common and well conserved in grassland and heathland in subalpine and alpine areas of Victoria and New South Wales.

Craspedia coolaminica J.Everett & Joy Thomps.

Illustration: Everett and Doust (1992), p. 223; Everett (1999), p. 761.

Craspedia coolaminica is widespread in the high country of Victoria and New South Wales, occurring in moister grasslands, heathlands, woodlands and bogs but predominantly (or entirely) below the upper climatic tree line. Unlike plants of this species in New South Wales and the description in Everett (1999), plants in Victoria seem to be consistently orange-flowered. At high altitudes in Victoria, this species may have broad leaves similar in dimensions to *C. maxgrayi*. It is distinguishable from that species by its distinct secondary longitudinal veins and persistent leaf bases. *Craspedia coolaminica* is well represented in conservation reserves in both New South Wales and Victoria and is not considered at risk.

Craspedia costiniana J. Everett & Joy Thomps.

Illustration: Everett and Doust (1992), p. 224; Costin *et al.* (2000), p. 191.

This distinctive species is endemic to the Main Range of Mt Kosciuszko at altitudes above c. 1900 m (e.g. Rawsons Pass, Mt Townsend, Blue Lake). It is locally common in dense *Poa fawcettiae* Vickery-dominated grassland and less common in other well-drained communities. Flowers are usually bright yellow but pale yellow and orange variants have also been observed. Although this species has a very limited geographic range, it does not appear to be under threat at present.

Craspedia crocata J.Everett & Joy Thomps.

Illustration: Everett and Doust (1992), p. 224; Everett (1999), p. 761.

In New South Wales, *C. crocata* tends to occur in moist vegetation (grassland, wet heath or bog) of subalpine or montane plains. In Victoria, *C. crocata* has been recorded in the Falls Creek area and some other parts of the Bogong High Plains in grassland, heathland and woodland. With few exceptions, *C. crocata* plants have orange flowers. A distinctive form of this species occurs in species-rich low grassland of a few subalpine plains (e.g. plains west of Mt Jagungal in Kosciuszko National Park, New South Wales, Pretty Valley on the Bogong High Plains, Victoria). The plants of this form grow in colonies amongst prostrate shrubs and dwarf tussocks. Their leaves and capitula are at the low end of the range for the species (typically to c. 5 cm long, c. 1 cm diameter respectively) and the flowers tend to be yellow-orange, at a distance appearing like *Leptorhynchos squamatus* (Labill.) Less. subsp. *alpinus* Flann, with which it grows in such vegetation. The few collections we had of this form did not enable us to find diagnostic characters that separated it from typical *C. crocata*. Further work may allow taxonomic recognition of this form. *Craspedia crocata* is well-protected and abundant throughout its range. The small, colony-forming form, if shown to be a distinct taxon, is rare (especially in Victoria) although not obviously threatened.

Craspedia jamesii J. Everett & Joy Thomps.

Illustration: Everett and Doust (1992), p. 225; Everett (1999), p. 765.

Craspedia jamesii is found in grassland and grassy woodland of subalpine plains, especially those of lower elevations (e.g. Nungar Plain and Long Plain in New South Wales, Snowy Range and Dinner Plain in Victoria). It can be distinguished from most other high country *Craspedia* by its glabrescent, green leaves and green leaf bases. From *C. aurantia* it differs usually in flower colour (yellow rather than orange) but also in its long, narrow stereome on the main capitula bract, which extends well past the membranous margins. Costin *et al.* (2000) treat this, with *C. aurantia*, as a complex and regard the bract morphology and flower colour as unreliable distinguishing characters. *Craspedia jamesii* is abundant and well conserved across its range.

Craspedia lamicola J.Everett & Joy Thomps.

Illustration: Everett and Doust (1992), p. 225; Costin *et al.* (2000), p. 192.

Although this species was not included in the *Flora of Victoria* account of *Craspedia* (Everett 1999), plants matching the description occur on the Bogong High Plains in Victoria (e.g. near Mt Cope and Mt Loch, but rare in both these localities). Victorian populations grow in damp vegetation (wet heathland and bog) as the species epithet (meaning 'bog-dweller') suggests. In New South Wales however, this species is more commonly found on dry, rocky ridges (e.g. Mt Etheridge).

Plants of *C. lamicola* are readily distinguished from other *Craspedia* species by their dark green leaves, which are ±glabrous on the lamina but conspicuously white-woolly on the margins. Victorian populations of *C. lamicola* have only been observed to have yellow flowers (although presumed hybrids with *C. aurantia* had somewhat orange flowers).

Craspedia lamicola has apparently become much more abundant in Kosciuszko National Park in the past 30 years (Max Gray, pers. comm.). *Craspedia* species are palatable to cattle (van Rees & Holmes 1986) and are much more common within cattle grazing exclosures established on the Bogong High Plains than outside (Wahren *et al.* 1994). It is possible that the scarcity of *C. lamicola* on the Bogong High Plains is related to past grazing practices. Nationally, the species is rare but not obviously threatened. The known Victoria population however, is very small. A status of vulnerable in Victoria (*sens.* Briggs & Leigh 1996) currently seems appropriate. The recent removal of grazing from the Victorian high country will hopefully facilitate its recovery as appears to have occurred in Kosciuszko National Park.

Craspedia leucantha F.Muell.

Illustration: Everett and Doust (1992), p. 223; Costin *et al.* (2000), p. 194.

This species is easily identified by its white florets and green, sparsely hairy leaves. It is endemic to the alpine zone of the Main Range in Kosciuszko National Park, where it is confined to seepage areas and creek edges. Nationally, the species might be regarded as vulnerable (*sens.* Briggs & Leigh 1996) because of its limited distribution and habitat, which appears to be associated with snow-melt. This habitat is perhaps most at risk from changing climate and its consequent reduced snowfalls. Populations of *Craspedia leucantha* were rarely seen by the authors during a floristic survey of the Main Range in 2003. Further survey is recommended for this species to determine more accurately its distribution and abundance.

Craspedia maxgrayi J.Everett & Joy Thomps.

Illustration: Everett and Doust (1992), p. 223; Costin *et al.* (2000), p. 193; Everett (1999), p. 761.

Craspedia maxgrayi is common on the Main Range of Kosciuszko National Park, where it can be found in grassland and open heath, generally above the tree-line. Outside the Main Range, it appears to occur only on the Mt Bogong plateau in Victoria, where it is rare. Plants with grey, woolly hairs on some leaves or on parts of leaves (especially the midrib) are common in the Mt Nelse–Spion Kopje area in Victoria (less common on Mt Hotham, Mt McKay and Mt Buffalo) and similar plants occur on the slopes of Mt Jagungal in New South Wales. They are perhaps of hybrid origin, the indumentum on their leaves being highly variable. Putative parents for these hybrids are *C. lamicola*, *C. adenophora*, *C. maxgrayi* and *C. coolaminica*. Flower colour may be yellow or orange. Genetic work on this curious and locally common variant may resolve its status. True *Craspedia maxgrayi* appears to have only bright yellow flowers.

Craspedia sp. 1 *sensu* Everett (1999), p. 762

Illustration: Everett (1999), p. 761.

This species is similar in appearance to *C. crocata* but differs in its broad leaves (to 40 mm wide). It occurs in subalpine woodland and montane forest (commonly associated with *Eucalyptus delegatensis*). Currently known from Mt Buffalo, Mt Buller, Mt Hotham, Mt Stirling, The Bluff and Lake Mountain areas. The conservation status of this species is unclear and requires clarification following further survey. It is probably well-protected and abundant over a large area. It is apparently endemic in Victoria.

This species is to be described elsewhere by Joy Everett (National Herbarium of New South Wales) who first realised its distinctness.

Acknowledgements

We are grateful to Max Gray (ex-CSIRO) for his encouragement when the taxonomy of the mountain *Craspedia* seemed too daunting, and for having the perspicacity to recognise most of the taxa in the 1979 edition of the Kosciuszko Alpine Flora.

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